

REMARKS

The Applicants request reconsideration of the rejection.

Claims 1-16 and 18-25 are now pending.

The Applicants thank the Examiner for signing and forwarding copies of the Forms PTO-1449 submitted with prior Information Disclosure Statements. The Applicants note, however, that the Examiner has crossed out Japanese Patent Publication No. 2001-163298, listed on the Form PTO-1449 filed March 7, 2005, without explanation. A copy of the document was submitted with the Information Disclosure Statement and a Petition to Make Special filed concurrently. Further, an explanation of the relevancy of the document was set forth in the Petition. Accordingly, the Applicants believe that all requirements for obtaining consideration and initialization by the Examiner have been satisfied. Therefore, the Applicants are submitting with this paper a copy of the Form PTO-1449, and request the Examiner to initial beside the document as an indication that the document has been considered, and that all requirements of 37 CFR §1.97-1.98 have been satisfied.

The Examiner required a new title, which has been provided above. Further, the formatting of the claims has been improved as set forth above.

Claims 8 and 19-23 were rejected under U.S.C. 112, first paragraph, as failing to comply with the "enablement" requirement. Specifically, the Examiner stated that the term identifier has been used inconsistently throughout the specification.

At the outset, the Applicants note that the claims have been amended, where appropriate, to clarify that the identifiers refer to volumes contained in the first-level (or first) and second-level (or second) storage units of the claims. Referring to Page 7, lines 1-7 of the specification, the storage units each contain at least one virtual storage area called a volume. Second-level storage units 102 and 102 (shown in Fig. 1) are connected to first-level storage unit 201 through a communication path in a hierarchical configuration. More than one volume may be allocated within one storage unit, or one volume may span more than one storage unit.

As set forth on Page 9, lines 12-13, each volume is assigned an identifier, such as the identifier of first-level volume 212, "ABC.XX200.0123.212." The volume number "212" in the identifier refers to volume 212. Table 245 (Fig. 3) contains an association between an identifier of an upper-level (first-level) volume and an identifier of a lower-level

(second-level) volume. Thus, for example, identifier "ABC.XX200.0123.212" of upper-level storage unit 201 is associated with identifier "DEF.YY100.0456.111" of lower-level storage unit 101, indicating that volume 212 has a hierarchical relationship with volume 111.

As explained on Page 10, lines 4-13, storing the identifiers with the associations as discussed above is important so that management computer 501 can recognize hierarchical relationships between volumes in the storage units of different level, so as to accurately determine the capacity of each volume. In the example shown in Fig. 3, the management computer 501 realizes that volume 111 is subordinate to volume 212 and that volume 161 is subordinate to volume 213, making the number of volumes 4, so as to calculate the total effective storage capacity to be 400 GB. By simply adding the capacity of each volume individually, the management computer 501 would have determined erroneously that a total of 600 GB (100 GB for each of volumes 211, 212, 213, 111, 161, and 162) were available in the computer system shown in Fig. 1.

The identifiers shown in Figs. 2(A), 2(B), and 2(C) are formatted according to an identifier format provided by an identifier management computer 601. As set forth on Page 13,

line 24, through Page 14, line 4, each storage unit has an identifier, but the identifiers of the storage units do not have a standardized format. Rather, each storage unit manufacturer provides an identifier according to its own identifier format. The identifier management computer 601 introduces a standardized identifier format, provided to each storage unit upon request, thereby registering and managing all of the storage units in the system using a standard format. The standard identifier format is shown at 650 in Fig. 5.

Referring to the specification from Page 15, through Page 16, line 3, the storage unit 201 executes, each time it is started up, an identifier format inquiring program 227, and sends a request for the identifier format to the identifier management computer 601. In response, the identifier management computer 601 sends the format 650 to the storage unit 201. The storage unit 201 saves this format 650 in its internal memory, and later when requested, composes volume information and hierarchy information in accordance with the format. Each storage unit, as well as the management computer 501, obtains and utilizes the identifier format 650 in this manner. Thus, the identifier format can be standardized and maintained among the storage units and management computer.

In summary, each volume of each storage unit has an identifier that is not formatted according to the standardized format, until the storage unit obtains the standardized identifier format. Each identifier refers to a virtual volume which is either contained in a single storage unit or allocated across more than one storage unit. The present invention is not limited by the manner in which virtual volumes are established or the manner in which their volume numbers are assigned. Furthermore, the identifier formatted according to identifier format 650 identifies the vendor name, model name, and manufacturing number of the storage unit, as well as the volume number of the volume. Therefore, the identifiers identify both virtual volumes and physical storage units.

In view of the above explanation, the Applicants request reconsideration of the rejection under 35 U.S.C. 112, first paragraph. Any further questions that the Examiner may have can be addressed by a telephone call to the attorney at the number listed below, if the Examiner believes that such a telephone call would expedite the understanding of the invention.

Claims 8-14 and 19-23 were rejected under U.S.C. 112, second paragraph, for the reasons set forth on Pages 4-5 of

the Office Action. The Applicants have amended the claims where appropriate to address the Examiner's concerns.

Claims 9 and 17 were rejected under 35 U.S.C. 101 as being not clearly directly to statutory subject matter. Claim 9 has been amended to clarify that it is indeed directed to a management computer. Adopting the suggestion of the Examiner, Claim 17 has been canceled and its subject matter added to Claim 18 to ensure that the claimed subject matter satisfies Section 101.

Claims 1-5, 9, 15, 18, and 24 were rejected under 35 U.S.C. §102(b) as being anticipated by Clifton, et al., US 4,310,883 (Clifton). The Applicants traverse as follows.

The independent claims have been amended to clarify certain features of the invention which have been "found" in Clifton due, apparently, to a word similarity between the rejected claims and the Clifton disclosure, despite a lack of similarity between the present invention and the invention disclosed in Clifton. In particular (using claim 1 as an example), whereas Clifton discloses a "computer system", "storage units" containing "volumes" for storing data used by a computer, and management of the "status" of the storage units, together with a storage unit "hierarchy", "collection" of volume "information" and hierarchical "information", and

determination of "capacity", it is clear that these terms have been interpreted without reference to the present specification. As a result, the rejection seems to be based on keyword matching more than on a true finding of anticipation.

Thus, to highlight some of the fundamental differences between the present invention and Clifton, the Applicants have amended the independent claims to insert context for some distinguishing claim terms, which would have been evident by reference to the specification, but in any event now makes the claims distinguishable from Clifton and the other art of record at a glance.

Referring particularly to claim 1, the claimed computer system comprises first- and second-level storage units having respective volumes that are hierarchically linked together, wherein "hierarchically linked" means that one or more second-level storage units have a volume that is available for use as a volume in one of the one or more first-level storage units. See the Specification at page 3, lines 2-8. In contrast, the "hierarchy" asserted in Clifton is simply an ordering by access speed between DASDs and mass storage such as tapes, with no hierarchical link except for the "link" that is necessary to transfer data from one type of storage to the

other in a "staging" or "destaging" process. While there must indeed be a "link" in order to transfer data, the link is not "hierarchical" in the sense of the originally-claimed invention. Nevertheless, to make the distinction more readily apparent, claim 1 has been amended as noted. Clifton, of course, does not suggest that the "link" between DASD storage and mass storage provides a volume that is available for use as a volume in a DASD.

Clifton also does not suggest means for collecting information on the hierarchical relationships between volumes contained in first-level storage units (DASDs, according to the rejection) and second-level storage units (mass storage, according to the rejection). The rejection asserts that the mass storage controller collects hierarchical relationship information "as it controls the staging and destaging operations, which create the hierarchical relationships." Clifton does not disclose that the mass storage controller collects information on the hierarchical relationships between volumes contained in the DASDs and mass storage, however. Furthermore, the staging and destaging operations do not "create" hierarchical relationships between volumes; rather, the "hierarchy" is defined by the inventors Clifton et al., in terms of speed of access to the respective types of storage,

and thus are predefined for the system with no need for "collection" by the mass storage controller.

Nevertheless, to highlight the difference from Clifton's mass storage controller, the claimed hierarchical information collecting means is newly recited as collecting information on the hierarchical relationships that identifies which volumes of the second-level storage units and first-level storage units are hierarchically linked together. The "hierarchical link", as discussed above, means that one or more second-level storage units have a volume that is available for use as a volume in one of the one or more first-level storage units.

Finally, with respect to claim 1, Clifton does not teach an effective capacity calculating means as claimed. The rejection finds this limitation "inherent" in Clifton's need to monitor space in the mass storage system. Setting aside that the law is well established that "inherency" is an extremely high standard to meet (and which is not met in the present rejection), there is no disclosure in Clifton that monitoring the volume space in mass storage requires knowledge of effective capacity. Moreover, monitoring the mass storage volume space does not seem to require knowledge of the volume information of both DASD and mass storage volumes, or of hierarchical information of the DASD and mass storage volumes,

as would be required to meet the claimed calculation of total effective capacity "based on the volume information and the hierarchical information thus collected." Nevertheless, to emphasize the distinction, the claim now recites that the effective capacity calculating means calculate the total effective capacity of the volume of the first-level and second-level storage units based on the volume information and the hierarchical information thus collected.

Among the dependent claims that have separate patentability, claim 3 is notable. Claim 3 recites that each of the first-level storage units comprises means for storing the information on the hierarchical relationships between volumes contained therein and volumes contained in the second-level storage units. Against this feature, the rejection relies upon the MSVI table 28 of Clifton, but the patent does not suggest that the MSVI table 28 stores any information about a hierarchical relationship, let alone hierarchical relationships between volumes of the DASDs and the mass storage, identifying which volumes of the mass storage and the DASDs are hierarchically linked together, wherein as hierarchically linked, the mass storage has a volume that is available for use as a volume in one of the DASDs.

Claim 5 is also notable in reciting that the information collected by the hierarchical information collecting means includes information indicating the relationship between an identifier of each volume contained in the first-level storage units and an identifier of its hierarchically-linked volume contained in the second-level storage unit. Against this limitation, the rejection asserts that "the number of the cartridges in the library [] are associated with the volume." Assuming the truth of this statement, there is no mention of identifiers of volumes contained in the DASDs (corresponding to the first-level storage units), or any hierarchical link as claimed. Both the cartridge numbers and any volume identifiers inferred to support the rejection appear to pertain to the mass storage only.

Independent claims 9, 15, 18, and 24 contain limitations similar to those discussed above, and the arguments concerning such limitations are incorporated here without repetition, for brevity.

Claims 6-7, 10-14, 16, 22, and 25 were rejected under 35 U.S.C. §103(a) as being unpatentable over Clifton in view of Prahlad, et al., US 2004/0250033 (Prahlad). Noting that Prahlad also does not teach or fairly suggest the features of the independent claims that are missing from Clifton, the

Applicants further note that Prahlad does not teach any display of information relating to hierarchically-linked storage devices, such that its combination with Clifton does not reach the subject matter of the rejected claims.

Claims 8, 19, and 20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Clifton in view of Kusters, et al., US 6,681,310 (Kusters). These dependent claims inherit the patentability of their independent claims, of course, but they are also patentable over the combination of Clifton and Kusters because neither Clifton nor Kusters discloses the identifier management computer required by these claims.

The Applicants note, too, the apparent confusion in the rejection concerning the claimed "identifier format". The rejection appears not to have found the claimed format of the identifier, but instead to allege that Kusters teaches a relevant usage of volume format. The Applicants refer the Examiner to the above discussion of identifiers and their standardized format as acquired by inquiry or request from (or "of") the identifier management computer.

Moreover, whether the common volume manager of Kusters provides a globally unique identifier for each logical volume, storage device, and volume provider does not address the

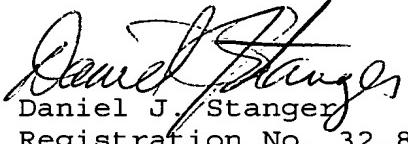
limitation that the format is provided from the identifier management computer to the storage units or management computer upon request, or that the volume information and hierarchical information are composed in accordance with the format. In view of these points, the rejection should be withdrawn.

Claim 23 was rejected under 35 U.S.C. §103(a) as being unpatentable over Clifton in view of Kusters and Prahlad. Each of these documents has been distinguished above with respect to the limitations for which they are applied against claim 23. Accordingly, the Applicants incorporate the above arguments here, and request reconsideration based on those arguments, which are not repeated for brevity.

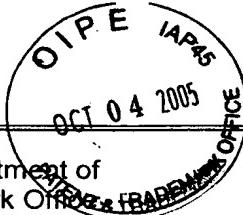
Claims 1 and 9 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting, as being unpatentable over claims 1 and 8, respectively, of copending Application No. 10/811,868. Without admitting to the propriety of the rejections, the Applicants note that the rejected claims have been amended as discussed above, and are therefore believed to be clearly different and not obvious in view of the claims of the copending application.

In view of the foregoing amendments and remarks, the Applicants request reconsideration of the rejection and allowance of the claims.

Respectfully submitted,


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**FORM PTO-1449 U.S. Department of
Commerce Patent and Trademark Office**

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use several sheets if necessary)

ATTY. DOCKET NO.
520.43541X00
APPLICANT
Y. KANEDA, et al
FILING DATE
February 26, 2004

U.S. PATENT DOCUMENTS

FOREIGN PATENT DOCUMENTS

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

EXAMINER

DATE CONSIDERED

EXAMINER: Initial if citation is considered, draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

(Form PTO-1449 [6-4])